

WHAT IS CLAIMED IS:

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1. An image sensing apparatus comprising:
  - an image sensing device;
  - 5 focusing means for focusing into an image on said image sensing device;
  - A/D conversion means for converting an image signal outputted by said image sensing device into a digital signal;
  - 10 color interpolation means for performing color interpolation on the digital signal converted by said A/D conversion means and generating image data on a plurality of color planes;
  - color space conversion means for converting a
  - 15 color space of the plurality of color planes to a color space of another colorimetric system; and
  - pseudo color removing means for reducing a color component, generated by said color interpolation means, by controlling a color difference signal converted by
  - 20 said color space conversion means.
2. The image sensing apparatus according to claim 1, wherein said pseudo color removing means includes an isolated point removing filter which
- 25 replaces a value of a pixel of interest with a substantial median pixel value of peripheral pixels of

the pixel of interest.

3. The image sensing apparatus according to claim 2, wherein said isolated point removing filter  
5 includes a median value filter or median filter.

4. The image sensing apparatus according to claim 1, wherein said color interpolation means  
10 generates image data in R, G and B planes.

5. The image sensing apparatus according to claim 1, wherein said color space conversion means  
converts RGB color space to YUV color space.

6. The image sensing apparatus according to claim 1, wherein said color space conversion means  
15 converts RGB color space to Y, R-Y, B-Y color space.

7. The image sensing apparatus according to claim 1, wherein said color space conversion means  
20 converts RGB color space to G, R-G, B-G color space.

8. The image sensing apparatus according to claim 1, wherein said focusing means includes an  
25 infrared ray filter, or an infrared ray filter and optical low pass filter.

9. An image sensing apparatus comprising:  
an image sensing device;  
focusing means for focusing into an image on said  
5 image sensing device;

A/D conversion means for converting an image  
signal outputted by said image sensing device into a  
digital signal;

color interpolation means for performing color  
10 interpolation on the digital signal converted by said  
A/D conversion means and generating image data on a  
plurality of color planes;

pseudo color removing means for reducing a color  
component included in image data, on which color  
15 interpolation is performed by said color interpolation  
means;

color space conversion means for converting a  
color space of the plurality of color planes, where the  
color component is reduced by said pseudo color  
20 removing means, to a color space of another  
colorimetric system; and

compression means for compressing image data  
where color space is converted by said color space  
conversion means.

25

10. The image sensing apparatus according to

claim 9, wherein said pseudo color removing means comprises:

first color space conversion means for converting a color space of the plurality of color planes to a color space of another colorimetric system;

isolated point removing means for reducing an isolated pseudo color component by controlling signals except a luminance component signal of the colorimetric system converted by said first color space conversion means; and

second color space conversion means for converting the color space, converted by said first color space conversion means, to an original color space.

11. The image sensing apparatus according to claim 10, wherein said isolated point removing means includes an isolated point removing filter which replaces a value of a pixel of interest with a substantial median pixel value of peripheral pixels of the pixel of interest.

12. The image sensing apparatus according to claim 11, wherein said isolated point removing filter includes a median value filter or median filter.

13. The image sensing apparatus according to claim 10, wherein said color interpolation means generates image data in R, G and B planes.

5 14. The image sensing apparatus according to claim 11, wherein said first color space conversion means converts RGB color space to  $L^*a^*b^*$  color space, and said isolated point removing means causes the isolated point removing filter to filter a frequency  
10 range of  $a^*$  and  $b^*$  signals.

15 15. The image sensing apparatus according to claim 10, wherein said color space conversion means converts RGB color space to YUV color space.

16. An image sensing apparatus comprising:  
an image sensing device;  
focusing means for focusing into an image on said  
image sensing device;

20 A/D conversion means for converting an image signal outputted by said image sensing device into a digital signal;

color interpolation means for performing color interpolation on the digital signal converted by said  
25 A/D conversion means and generating image data on a plurality of color planes;

separation means for separating the image data in the plurality of color planes into luminance data and color difference data;

5 extraction means for extracting a high frequency component from the luminance data separated by said separation means; and

10 pseudo color removing means for reducing a color component generated by said color interpolation means, in accordance with the high frequency component of the luminance data extracted by said extraction means and hue data obtained from the color difference data.

15 17. The image sensing apparatus according to claim 16, wherein said pseudo color removing means comprises:

determination means for determining whether or not the high frequency component of the luminance data and the hue data fall within a color range of the pseudo color; and

20 means for reducing a value of the color difference data, determined to be within the color range by said determination means.

25 18. An image sensing apparatus comprising:  
an image sensing device;  
focusing means for focusing into an image on said

image sensing device;

A/D conversion means for converting an image signal outputted by said image sensing device into a digital signal;

5 color interpolation means for performing color interpolation on the digital signal converted by said A/D conversion means and generating image data on a plurality of color planes;

10 color space conversion means for converting a color space of the plurality of color planes to a color space of another colorimetric system;

separation means for separating image data in the color space of another colorimetric system into luminance data and hue data;

15 extraction means for extracting a high frequency component from the luminance data separated by said separation means; and

20 pseudo color removing means for reducing a color component generated by said color interpolation means, in accordance with the high frequency component of the luminance data extracted by said extraction means and the hue data.

19. The image sensing apparatus according to  
25 claim 18, wherein said pseudo color removing means comprises:

determination means for determining whether or not the high frequency component of the luminance data and the hue data fall within a color range of the pseudo color; and

5 means for reducing a value of the color difference data, determined to be within the color range by said determination means.

20. The image sensing apparatus according to  
10 claim 18, wherein said color space conversion means converts the color space to YUV, or Y, R-Y, B-Y, or G, R-G, B-G color space.

21. The image sensing apparatus according to  
15 claim 18, further comprising a low pass filter for removing a high frequency component from a color signal, from which a pseudo color is removed by said pseudo color removing means.

22. The image sensing apparatus according to  
20 claim 18, wherein the color range of a pseudo color includes a color area from red to yellow, and a color area from blue to cyan.

23. The image sensing apparatus according to  
25 claim 18, further comprising isolated point removing



means for removing an isolated pixel from a hue signal,  
from which the pseudo color is removed by said pseudo  
color removing means.

5           24.    The image sensing apparatus according to  
claim 23, wherein said isolated point removing means  
includes a median filter.

25.    An image sensing apparatus comprising:  
10       an image sensing device;  
      focusing means for focusing into an image on said  
image sensing device;

      A/D conversion means for converting an image  
signal outputted by said image sensing device into a  
15   digital signal;

      color interpolation means for performing color  
interpolation on the digital signal converted by said  
A/D conversion means and generating image data on a  
plurality of color planes;

20       color space conversion means for converting a  
color space of the plurality of color planes to a color  
space of another colorimetric system;

      separation means for separating image data in the  
color space of another colorimetric system into  
25   luminance data and hue data;

      extraction means for extracting a high frequency

component from the luminance data separated by said separation means;

isolated point removing means for removing an isolated pixel based on the hue data separated by said separation means; and

pseudo color removing means for reducing a color component generated by said color interpolation means, in accordance with the high frequency component of the luminance data extracted by said extraction means and the hue data from which an isolated pixel is removed by said isolated point removing means.

26. The image sensing apparatus according to claim 25, wherein said pseudo color removing means comprises:

determination means for determining whether or not the high frequency component of the luminance data and the hue data fall within a color range of the pseudo color component; and

means for reducing a value of the color difference data, determined to be within the color range by said determination means.

27. The image sensing apparatus according to claim 25, wherein said color space conversion means converts the color space to YUV, or Y, R-Y, B-Y, or G,

R-G, B-G color space.

28. The image sensing apparatus according to claim 25, further comprising a low pass filter for removing a high frequency component from a color signal, from which a pseudo color is removed by said pseudo color removing means.

29. The image sensing apparatus according to claim 25, wherein the color range of the pseudo color includes a color area from red to yellow, and a color area from blue to cyan.

30. An image processing method for an image sensing apparatus which includes an image sensing device and generates an image signal corresponding to an image formed on the image sensing device, comprising:

an A/D conversion step of converting an image signal outputted by the image sensing device into a digital signal;

a color interpolation step of performing color interpolation on the digital signal converted in said A/D conversion step and generating image data on a plurality of color planes;

a color space conversion step of converting a

color space of the plurality of color planes to a color space of another colorimetric system; and

5 a pseudo color removing step of reducing a color component, generated in said color interpolation step, by controlling a color difference signal converted in said color space conversion step.

31. The image processing method according to claim 30, wherein in said pseudo color removing step, a value of a pixel of interest is replaced with a substantial median pixel value of peripheral pixels of the pixel of interest.

32. The image processing method according to claim 30, wherein in said pseudo color removing step, filtering is performed by a median value filter or median filter.

33. The image processing method according to claim 30, wherein in said color interpolation step, image data is generated in R, G and B planes.

34. The image processing method according to claim 30, wherein in said color space conversion step, RGB color space is converted to YUV color space.

35. The image processing method according to claim 30, wherein in said color space conversion step, RGB color space is converted to Y, R-Y, B-Y color space.

5 36. The image processing method according to claim 30, wherein in said color space conversion step, RGB color space is converted to G, R-G, B-G color space.

37. An image processing method for an image  
10 sensing apparatus which includes an image sensing device and generates an image signal corresponding to an image formed on the image sensing device, comprising:

an A/D conversion step of converting an image  
15 signal outputted by the image sensing device into a digital signal;

a color interpolation step of performing color interpolation on the digital signal converted in said A/D conversion step and generating image data on a  
20 plurality of color planes;

a pseudo color removing step of reducing a color component included in image data, on which color interpolation is performed in said color interpolation step;

25 a color space conversion step of converting a color space of the plurality of color planes, where a

pseudo color component is reduced in said pseudo color removing step, to a color space of another colorimetric system; and

a compression step of compressing image data  
5 where color space is converted in said color space conversion step.

38. The image processing method according to claim 37, wherein in said pseudo color removing step, a  
10 value of a pixel of interest is replaced with a substantial median pixel value of peripheral pixels of the pixel of interest.

39. The image processing method according to  
15 claim 37, wherein in said pseudo color removing step, filtering is performed by a median value filter or median filter.

40. The image processing method according to  
20 claim 37, wherein in said color interpolation step, image data is generated in R, G and B planes.

41. The image processing method according to claim 37, wherein in said color space conversion step,  
25 RGB color space is converted to L\*a\*b\* color space, and filtering is performed to a\* and b\* signals in said

pseudo color removing step.

42. The image processing method according to claim 37, further comprising a conversion step of  
5 converting the signal, processed in said pseudo color removing step, into YUV color space.

43. The image processing method according to claim 37, wherein in said compression step, image data  
10 converted to YUV color space is compressed.

44. An image processing method for an image sensing apparatus which includes an image sensing device and generates an image signal corresponding to  
15 an image formed on the image sensing device, comprising:

an A/D conversion step of converting an image signal outputted by the image sensing device into a digital signal;

20 a color interpolation step of performing color interpolation on the digital signal converted in said A/D conversion step and generating image data on a plurality of color planes;

a separation step of separating the image data in  
25 the plurality of color planes into luminance data and color difference data;

an extraction step of extracting a high frequency component from the luminance data separated in said separation step; and

5 a pseudo color removing step of reducing a color component generated in said color interpolation step, in accordance with the high frequency component of the luminance data extracted in said extraction step and hue data obtained from the color difference data.

10 45. The image processing method according to claim 44, wherein said pseudo color removing step comprises:

15 a determination step of determining whether or not the high frequency component of the luminance data and the hue data fall within a color range of the pseudo color; and

a step of reducing a value of the color difference data, determined to be within the color range in said determination step.

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25 46. The image processing method according to claim 44, further comprising a step of removing a high frequency component from a color signal, from which the pseudo color is removed in said pseudo color removing step.



47. The image processing method according to claim 44, wherein the color range of a pseudo color includes a color area from red to yellow, and a color area from blue to cyan.

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48. An image processing method for an image sensing apparatus which includes an image sensing device and generates an image signal corresponding to an image formed on the image sensing device,

10 comprising:

an A/D conversion step of converting an image signal outputted by the image sensing device into a digital signal;

15 a color interpolation step of performing color interpolation on the digital signal converted in said A/D conversion step and generating image data on a plurality of color planes;

20 a color space conversion step of converting a color space of the plurality of color planes to a color space of another colorimetric system;

a separation step of separating image data in the color space of another colorimetric system into luminance data and hue data;

25 an extraction step of extracting a high frequency component from the luminance data separated in said separation step; and

5 a pseudo color removing step of reducing a color component generated in said color interpolation step, in accordance with the high frequency component of the luminance data extracted in said extraction step and the hue data.

49. The image processing method according to claim 48, wherein said pseudo color removing step comprises:

10 a determination step of determining whether or not the high frequency component of the luminance data and the hue data fall within a color range of the pseudo color; and

15 a step of reducing a value of the color difference data, determined to be within the color range by said determination step.

50. The image processing method according to claim 48, wherein in said color space conversion step, 20 the color space is converted to YUV, or Y, R-Y, B-Y, or G, R-G, B-G color space.

51. The image processing method according to claim 48, further comprising a step of removing a high 25 frequency component from a color signal, from which the pseudo color is removed in said pseudo color removing

step.

52. The image processing step according to claim 48, wherein the color range of a pseudo color component includes a color area from red to yellow, and a color area from blue to cyan.

53. An image processing method for an image sensing apparatus which includes an image sensing device and generates an image signal corresponding to an image formed on the image sensing device, comprising:

an A/D conversion step of converting an image signal outputted by the image sensing device into a digital signal;

a color interpolation step of performing color interpolation on the digital signal converted in said A/D conversion step and generating image data on a plurality of color planes;

a separation step of separating image data in the plurality of color planes into luminance data and color difference data;

an extraction step of extracting a high frequency component from the luminance data separated in said separation step;

a pseudo color removing step of reducing a color

component generated in said color interpolation step,  
in accordance with the high frequency component of the  
luminance data extracted in said extraction step and  
the hue data obtained from the color difference data;  
5 and

an isolated point removing step of removing an  
isolated pixel from the hue data, from which a pseudo  
color component is removed in said pseudo color  
removing step.

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54. The image processing method according to  
claim 53, wherein said pseudo color removing step  
comprises:

a determination step of determining whether or  
15 not the high frequency component of the luminance data  
and the hue data fall within a color range of a pseudo  
color component; and

a step of reducing a value of the color  
difference data, determined to be within the color  
20 range in said determination step.

55. The image processing method according to  
claim 53, further comprising a step of removing a high  
frequency component from a color signal, from which the  
25 pseudo color is removed in said pseudo color removing  
step.

56. The image processing method according to claim 53, wherein the color range of the pseudo color component includes a color area from red to yellow, and  
5 a color area from blue to cyan.

57. An image processing method for an image sensing apparatus which includes an image sensing device and generates an image signal corresponding to  
10 an image formed on the image sensing device, comprising:

an A/D conversion step of converting an image signal outputted by the image sensing device into a digital signal;

15 a color interpolation step of performing color interpolation on the digital signal converted in said A/D conversion step and generating image data on a plurality of color planes;

20 a color space conversion step of converting a color space of the plurality of color planes to a color space of another colorimetric system;

a separation step of separating image data in the color space of another colorimetric system into luminance data and hue data;

25 an isolating point removing step of removing an isolated pixel based on the hue separated in said

separation step;

an extraction step of extracting a high frequency component from the luminance data separated in said separation step; and

5 a pseudo color removing step of reducing a color component generated in said color interpolation step, in accordance with the high frequency component of the luminance data extracted in said extraction step and the hue data from which an isolated pixel is removed in  
10 said isolated point removing step.

58. The image processing method according to claim 57, wherein said pseudo color removing step comprises:

15 a determination step of determining whether or not the high frequency component of the luminance data and the hue data fall within a color range of the pseudo color; and

a step of reducing a value of the color  
20 difference data, determined to be within the color range in said determination step.

59. The image processing method according to claim 57, wherein in said color space conversion step,  
25 the color space is converted to YUV, or Y, R-Y, B-Y, or G, R-G, B-G color space.

60. The image processing method according to claim 57, further comprising a step of removing a high frequency component from a color signal, from which the pseudo color is removed in said pseudo color removing step.

61. The image processing method according to claim 57, wherein the color range of the pseudo color component includes a color area from red to yellow, and a color area from blue to cyan.